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AUTUMN 2015

SAVING SPECIES WITH science

Celebrating four decades of the Smithsonian Conservation Biology Institute.

» Learn how to save a species at the brink of extinction.

» Explore the latest in climate-monitoring science: NEON.

» Meet cranes, bison, maned wolves, and more!

The magazine for members of **FONZ** | FRIENDS OF THE NATIONAL ZOO

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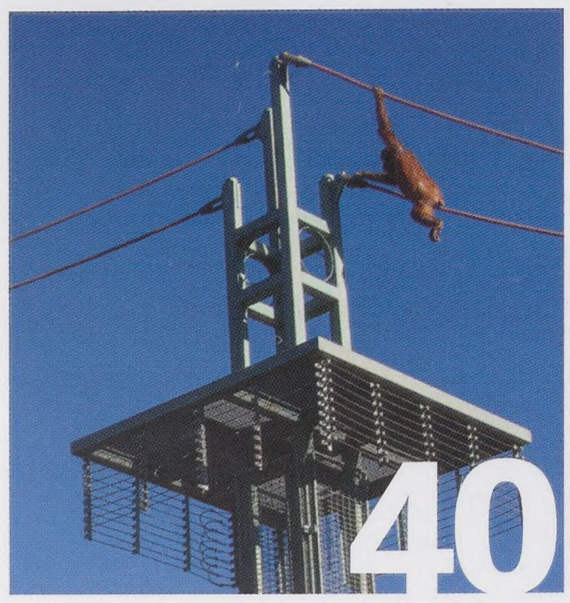

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FONZ Friends of the National Zoo is the dedicated partner of the Smithsonian's National Zoological Park. FONZ provides exciting and enriching experiences to connect people with wildlife. Together with the Zoo, FONZ is building a society committed to restoring an endangered natural world. Formed in 1958, FONZ was one of the first conservation organizations in the nation's capital.

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Membership in FONZ supports the animal care, conservation, and educational work of the Smithsonian's National Zoo. It also offers many benefits: a *Smithsonian Zoogoer* subscription, discounts on shopping and events, discounted or free parking, and invitations to special programs and activities. To join, call 202.633.2922, or visit **fonz.org/join.**

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Publisher: Lynn Mento
Editors: Cristina Santiestevan and Peter Winkler
Design: 2farthings:design
Email: Zoogoer@si.edu

On the cover: Przewalski's horses were once extinct in the wild. Today, thanks to help from Zoo science, they again roam free.
PHOTO BY JESSIE COHEN/NZP

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NEW FRIENDS. NEW BEGINNINGS.

COURTNEY SMITH/FONZ

I CANNOT BEGIN TO TELL YOU HOW EXCITED I AM TO BE JOINING FONZ. The Smithsonian's National Zoo has always been a magical place for me and my children, Veronica and Max, and FONZ is an essential part of that experience. Now, I'm taking the baton from the trusted hands of Bob Lamb, who served as FONZ's executive director for nearly nine years before his retirement. It's an honor to keep alive the many wonderful programs Bob and the FONZ team put in place during those years—and to now have the opportunity to build on that legacy to create even more value for you and your families.

In our 57 years and counting, FONZ has helped the Zoo and visitors in big ways—such as our recent $1 million contribution to the transformation of the Bird House—and in uncountable smaller ways through the consistent dedication of our hardworking staff, interns, and 1,500 volunteers, all of whom have made it their personal mission to help the Zoo staff ensure the animals are healthy and happy, and ensure that all visitors to the Zoo have the most inspirational experience possible. You simply can't help but feel happier—and more connected to the natural world—when you're standing in the National Zoo.

None of this would be possible without you. Your membership and commitment to FONZ is what allows us, together, to help the Zoo with everything from animal care to the groundbreaking species conservation work being done at the Smithsonian Conservation Biology Institute.

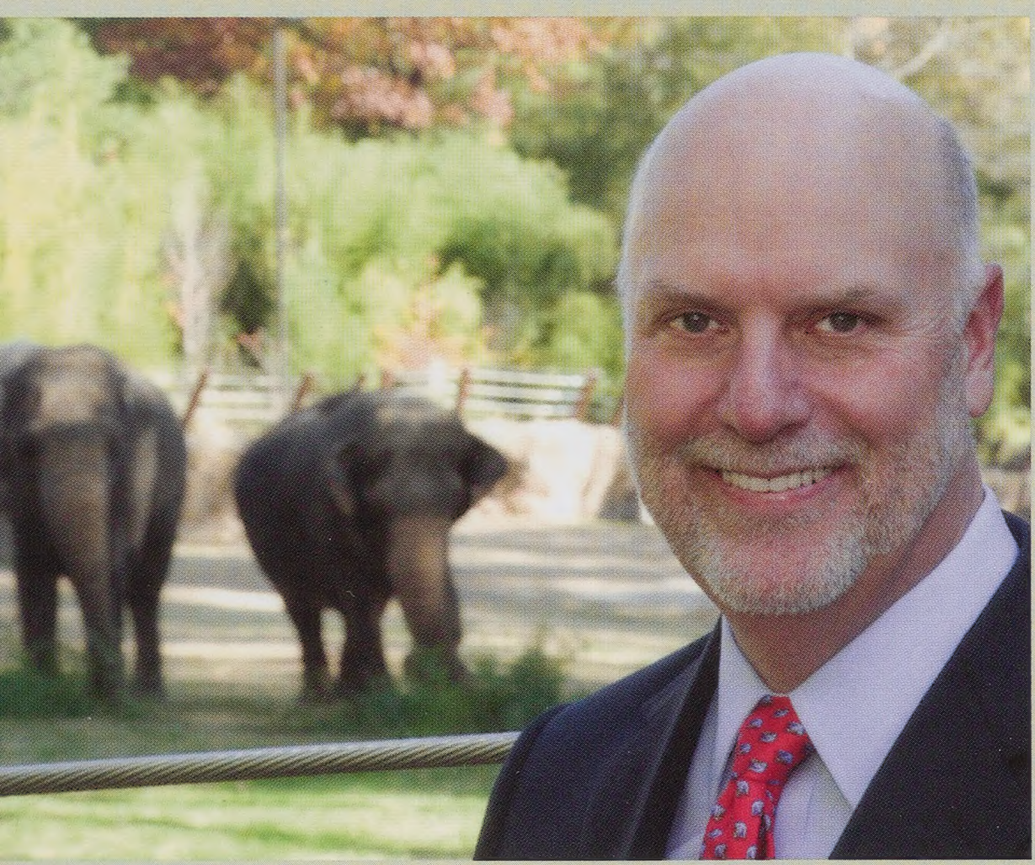
I know I speak for us all—FONZ and Zoo staff alike—when I say that we thank each and every one of you for your current and ongoing loyalty to FONZ. You are directly helping to ensure that we—and the animals—enjoy amazingly rich experiences at the Zoo and SCBI. Even more importantly, your membership support helps save species and save our planet for our children and their children to come. Thank you.

It is an honor to be here. We have big plans ahead, but we also want to hear your ideas for the future of FONZ. Please feel free to connect with me and my team as we—together—take FONZ to the next level. Email me at **FONZExecutiveDirector@si.edu**, friend us at **facebook.com/FriendsoftheNationalZoo**, follow and tweet with us at **twitter.com/FONZNationalZoo**, or just find me at one of the terrific FONZ events coming up this year.

Best,

Lynn Mento
Executive Director, Friends of the National Zoo

40 YEARS, AND COUNTING



MEHGAN MURPHY/NZP

WITH THIS ISSUE, WE CELEBRATE THE 40TH ANNIVERSARY of the Smithsonian Conservation Biology Institute in Front Royal, Virginia. What started as a small but ambitious breeding facility for endangered species has grown into an unparalleled institution dedicated to advancing conservation and ecological research worldwide.

How do we measure the value of the Smithsonian Conservation Biology Institute? Do we add up all the births and hatchings that enable us to study first-hand the reproduction and biology of endangered species? Do we list all the students and professionals who have learned from SCBI scientists in Front Royal and all over the world? Do we gather together all of the research papers and studies that have helped scientists better understand the world's biodiversity? Or do we attempt to tally up all the species that have been spared extinction thanks in part to the science and conservation advancements made at SCBI every day?

In truth, there is no way to truly and fully measure the value of this place. The term "uncountable" surely applies to its many accomplishments and the broad reaching impacts of SCBI's past and ongoing work to breed and save species in Front Royal, Virginia, at the Zoo, and around the world.

Within this issue, you will find two feature articles that dive deep into two of SCBI's many projects—the challenge of saving species from extinction and a new ecological monitoring program that measures and tracks climate change.

But this is just a fraction of the incredible work being done at SCBI. To discover more, I hope you will join us for our annual Autumn Conservation Festival on October 3 and 4 at the Smithsonian Conservation Biology Institute. There, you will meet SCBI's scientists, animal keepers, veterinarians, educators, volunteers, and perhaps even some of our Smithsonian-Mason School of Conservation students—the conservation leaders of the next generation. You will also be able to see some of SCBI's many rare and endangered animals, including maned wolves, bison, white-naped cranes, and more. Visit **fonz.org/acf** to learn more about the event, and **fonz.org/join** to upgrade your membership and claim a free parking pass.

Because of the support of members like you, we are celebrating an amazing four decades of SCBI, but more importantly, your support enables us to save species for the next 40 years! Looking ahead to those coming years, I'm especially excited by the addition of Lynn Mento as the newest executive director for FONZ. Please join me in extending a very warm welcome to her—you will find her first letter to you on page 3 of this issue.

Thank you for all your support.

Sincerely,

Dennis Kelly
Director, Smithsonian's National Zoological Park

LAUREN AUGUSTINE/NZP

CONNOR MALLON/NZP

TO SAVE AN EGG AND HATCH A TORTOISE

What do you do with a real life Humpty-Dumpty scenario involving a precious egg of a critically endangered tortoise? That's exactly the question Zoo keepers Robin Saunders and Lauren Augustine found themselves facing in May, when a spider tortoise egg developed a crack and began to leak during incubation. The pair used a technique that has been employed successfully with bird eggs, but had never before been tested with reptile eggs—they made a patch. Using a bit of glue and a scrap of sterilized eggshell from a hatched gecko egg, Saunders and Augustine repaired the broken egg. And then they—along with their fellow keepers—waited.

On June 8, their wait was rewarded. A healthy baby tortoise poked its head out and joined the world. This marks the second spider tortoise hatching for the Zoo this year; another tortoise hatched from an undamaged egg on May 10. Both hatchlings are currently on exhibit at the Reptile Discovery Center, where they continue to do well. **fonz.org/tosaveanegg**

LAUREN AUGUSTINE/NZP

Two New Iguanas

The Zoo's Reptile Discovery Center celebrated a double birthday on April 25 when a pair of Fiji Island iguana eggs hatched from eggs laid by the Zoo's adult female iguana in November 2014. Both hatchlings—a male and a female—remain behind the scenes and are doing well.

Tiny GPS Tags. Big Science.

Using miniaturized GPS tags in tiny 'backpacks' weighing just 0.04 ounces, Smithsonian Migratory Bird Center (SMBC) biologists have tracked the migratory paths of ovenbirds—a species of bird too small to carry larger tracking devices. The SMBC's successful deployment marks the first use of these new tags, and heralds a new era for biologists studying the movements of small birds and other animals. "Tracking an animal this small, with a device of this size, and with this degree of precision has never been done," said Peter Marra, head of the Migratory Bird Center. "Now we can identify the exact territories these birds occupied on their tropical wintering grounds. Miniaturizing technology so we can track animals throughout their annual cycle is an essential ingredient of effective conservation." **fonz.org/tinygpstags**

Lucky Seven

Congratulations to the Smithsonian Conservation Biology Institute, where seven red panda cubs were recently born to mothers Nutmeg, Regan, and Leo Mei. Learn more and see a video of the cubs online: **fonz.org/luckyseven**

JANICE SVEDA/FONZ PHOTO CLUB

#PandaStory

Stay tuned to the latest updates from Mei Xiang and her family on Twitter, Instagram, and Facebook with #PandaStory.

CONNOR MALLON/NZP

Farewell Kandula

Since the day he was born on November 25, 2001, Kandula the Asian elephant has called the Smithsonian's National Zoo his home. Now, as he nears his 14th birthday, Kandula and his keepers are preparing for the next big thing in his life: a move to a new zoo and the chance to become a father.

Kandula is leaving to participate in the Species Survival Plan (SSP) for Asian elephants, the Association of Zoos and Aquariums' breeding program. Sometime this fall or early winter, Kandula will journey from Washington, D.C., to the Oklahoma City Zoo, where he will join the zoo's herd of seven Asian elephants.

Kandula will remain on exhibit until his departure. As we prepare to say "farewell" to Kandula, we will keep you posted on his crate training—his travel crate is already visible in his yard for acclimation—and a celebratory event in his honor to be held before his departure. **fonz.org/kandula**

SMITHSONIAN CONSERVATION BIOLOGY INSTITUTE

Smile for the Camera

Camera traps allow scientists to keep track of animal movements even when they're far away. The "traps" are really weatherproof cameras—often camouflaged and attached to a tree—that automatically take one or more photographs when an animal moves nearby. Now, for the first time, biologists with the Smithsonian Conservation Biology Institute have used camera traps to document Andean bears in Peru's Amarakaeri Comunal Reserve. The data collected from these cameras will help biologists better understand the bears' movement through and use of the Amarakaeri Comunal Reserve, and may lead to better protections for the vulnerable species. **fonz.org/smileforthecamera**

Keeping Penguins SAFE

Zoos and the Association of Zoos and Aquariums (AZA) have partnered to launch a new species-saving program: Saving Animals From Extinction (SAFE). The program is focusing on 10 species in 2015, including African penguins. Steve Sarro, the Zoo's curator of small mammals, bison, and Asia Trail, heads the AZA's African penguin Species Survival Plan, and will play an integral role with the species' SAFE program as well.

10 Loggerhead Shrikes Hatch at SCBI

Loggerhead shrikes—also called butcher birds—are known for their habit of catching grasshoppers, lizards, and other small animals and then impaling their prey on thorns or barbed wire for later use. The birds were once common across North America, but their population has fallen by 70 percent in recent years and they may soon be added to the endangered species list. There may be as few as 100 wild loggerhead shrikes left in the entire state of Virginia.

The Smithsonian Conservation Biology Institute is home to 22 loggerhead shrikes, including 10 chicks that hatched on May 3, 7, and 8 to three sets of parents. If they continue to thrive, these chicks will transfer to the Toronto Zoo this fall, where they will be prepared for reintroductions into the wild. **fonz.org/10loggerheadshrikes**

WARREN LYNCH/NZP

CONNOR MALLON/NZP

TWO NEW KORI BUSTARDS

Bird House curator Sara Hallager has her hands full with two new charges—a pair of kori bustard chicks that hatched June 15 and 24. The two chicks—like all kori bustards hatched at the Zoo—are being hand-reared to ensure their safety from predators. fonz.org/twonewkoribustards

Two Clouded Leopards Born in Thailand with Help from Zoo

For only the second time, a litter of clouded leopard cubs has been born as the result of an artificial insemination. Pierre Comizzoli, reproductive physiologist at the Smithsonian Conservation Biology Institute (SCBI), performed the artificial insemination in Thailand last March. The two cubs were born at the Khao Khew Open Zoo in Chonburi, Thailand on June 9. The artificial insemination was the first successful procedure performed on a clouded leopard outside of the United States. The first and only other successful artificial insemination in clouded leopards was performed by the late SCBI scientist JoGayle Howard in 1992. **fonz.org/twocloudedleopardsborn**

Mark Your Calendar

Sept. 12: **Conservation Science Day**—Discover the science, people, and stories behind the Zoo's species-saving conservation work. 10 a.m. to 2 p.m. FREE

Sept. 20: **ZooFiesta**—Celebrate Hispanic Heritage Month with animal demonstrations, Zoo experts, family activities, and more. 10 a.m. to 2 p.m. FREE — **fonz.org/fiesta**

Oct. 3–4: **Autumn Conservation Festival**—Venture out to Front Royal, Virginia, to explore the Smithsonian Conservation Biology Institute during its once-a-year, two-day open house. Tickets available August 20. **fonz.org/acf**

Oct. 23–25: **Boo at the Zoo**—It's the wildest trick-or-treat event in the D.C. region! Bring the whole family for a frightfully fun evening at the Zoo. Tickets available September 1. **fonz.org/boo**

Oct. 30: **Night of the Living Zoo**—With live music, craft beer, food trucks, glow in the dark lawn games, and more, this is one wicked night of fun that you won't want to miss! Tickets available September 18. **fonz.org/nolz**

Nov. 27–Jan. 1: **ZooLights, powered by Pepco**—Come enjoy live music, tasty winter treats, a dazzling light show, and more than 500,000 environmentally-friendly LED lights as they transform the Zoo into a winter wonderland. FREE — **fonz.org/zoolights**

How to **SAVE A SPECIES:** *Some Assembly Required*

BY BRITTANY STEFF

To save a species, simply gather up all the remaining animals from their native habitat. Keep them in a zoo or breeding center for a few years. Allow them to multiply. Then release them back into the wild. Species saved. Nothing could be simpler.

Or so it seems.

The devil, as they say, is in the details.

STEP 1: Collect the Components

To save a species, biologists first have to find it.

In some cases the hard work of collecting a species has already been done for scientists. For example, with both Przewalski's horses and scimitar-horned oryx, private collectors had already amassed small populations before their wild populations disappeared entirely.

Other times biologists get unexpectedly lucky, which is what happened with the black-footed ferret. Feared extinct in the wild,

Now extinct in the wild, scimitar-horned oryx once roamed across northern Africa's arid plains and deserts. The species will soon be reintroduced to Chad.

JESSIE COHEN/NZP

VICTORIA LAKE/NZP

MEHGAN MURPHY/NZP

North America's only ferret was mourned as gone forever until a ranch dog in Wyoming showed up with one in his mouth in 1981. After several years of observation, biologists captured all the ferrets from this previously unknown population—probably the last surviving black-footed ferrets on the planet. These 18 animals became the founders of a new population of ferrets, and a subset of these are the ancestors of all black-footed ferrets alive today.

And sometimes it is just simple hard work to find and collect already elusive rare animals. Especially when the animals are small.

For example, scientists knew that the Atelopus genus of toads—called harlequin toads—were at risk of extinction from habitat encroachment and the deadly amphibian fungus, chytrid. To save the species group, amphibian biologists agreed upon a prioritized list of species they wanted to collect to keep in the safety of human care. They set a goal of finding 40 individuals—20 males and 20 females—of each species. Sometimes this was easy. Other times, dozens of repeat expeditions yielded nothing.

"We have these priority species we're going out to look for," explains Zoo biologist Matt Evans. "It's a very detailed plan. We're going to certain habitats, certain areas. These areas are not easy to access. We had to fly a six-man propeller plane, land in a grassy field, hike for a full day to an area

Genetic Bottlenecks and Founder Effects

Populations and species are generally at their healthiest when there is a large amount of genetic diversity among the population's members. The reason for this is fairly simple: When a population is genetically diverse, there is a good chance that a single disease or other threat will not wipe out the entire population because some individuals are likely to be resistant. Even if a new disease were to eliminate a large number of individuals, a healthy population would often be able to bounce back because any surviving individuals would be partially or fully resistant to the new threat.

Trouble comes when a population is reduced to just a few individuals. Black-footed ferrets, for example, were once reduced to just 18 animals in the whole world. Of these only about one-third were able to successfully breed and produce offspring. The genetic diversity of those few animals is much smaller than that of a healthy population of thousands or millions of ferrets. The result is that those original ferrets and all their offspring are at a greater risk to disease and other threats, simply because they have less genetic diversity.

Scientists use the terms "genetic bottleneck" and "population bottleneck" to refer to any event that might dramatically reduce a population's size and genetic diversity. Floods, droughts, and other natural disasters might cause a genetic bottleneck, as may overhunting, disease, habitat loss, climate change, invasive species, and many other threats, both natural and human caused. The genetic bottleneck for ferrets—the reason behind their near brush with extinction—is believed to be a combination of habitat loss, the decline of prairie dogs, and disease.

If the population survives the catastrophic event—the genetic bottleneck—it may begin to recover. But any recovery will be impacted by the reduced genetic diversity of the surviving members. This increases the risk of inbreeding, and may also lead to a higher incidence of rare genetic disorders, diminished health, and increased vulnerability to disease and natural events. This is known as a "founder effect." Some biologists believe that black-footed ferrets' susceptibility to disease may be a result of a founder effect.

Examples of genetic bottlenecks and founder effects can be seen in many species, including humans. The impacted species will eventually regain genetic diversity—assuming it survives its population decline—but the process is slow and takes many, many generations to accomplish.

MEHGAN MURPHY/NZP

JESSIE COHEN/NZP

where if you were to get injured, it was a three-day walk to anywhere where there's even a phone. And the toads are not easy to find. They're rare, and the conditions have to be just right. It's not just running down to the stream and collecting as many toads as you can get."

STEP 2: Save All the Pieces

Often, biologists are not able to dictate how many individuals they can save. They make do with the animals available to them, which is often a shockingly low number. Przewalski's horses, for example, dropped to a global population of approximately 50 animals. The world's Hawaiian crow population may have once been reduced to only five individuals. A mere 15 adult whooping cranes existed at one point.

When numbers are so low, the project of just keeping the animals alive takes on a sense of urgency. Scientists call these collections of captive animals "insurance" or "assurance" populations, because their whole goal is to assure that the species will continue to exist. The captive population is an insurance policy against extinction.

SCBI scientist Jon Ballou has worked at the forefront of saving dozens of species. "It's a scary time. The level of tension and anxiety is enormous. The species is on the line, and when you have so few individuals, the decision you make about one animal can affect the entire population."

Scientists and animal managers typi-

JESSIE COHEN/NZP

Since 1988, the Smithsonian Conservation Biology Institute has celebrated the birth of 725 black-footed ferret kits. Of these, many have since been successfully released into the wild, where they help establish free-roaming populations in the North American plains. Shown here from left to right are an approximately 10-day-old kit; five 30-35-day-old kits; several kits of about 50-60 days old; an adult ferret being released in the prairie; and a ferret in Arizona.

The wild whooping crane population plummeted to just 15 adult birds in 1938. As of 2010, following decades of captive breeding and reintroduction programs, the species' wild population had grown to number nearly 400 birds.

MEHGAN MURPHY/NZP

cally figure out what works using a mix of intuition, informed guesses, and a comprehensive campaign of trial-and-error. Whenever possible, scientists study the biology of a species' nearest living relative, and hope that the lessons learned are relevant. For black-footed ferrets, this meant quickly obtaining and studying Siberian polecats. And with Przewalski's horses and scimitar-horned oryx, this meant examining the life history of close cousins.

But when the Micronesian kingfisher's global population dropped to 29 animals and conservationists decided to bring them into human care, no one had studied them before. Scientists knew that Micronesian kingfishers—unlike other kingfishers—didn't eat fish. But they weren't sure what they did eat. And that's about all they knew. "It was a huge learning curve," says Warren Lynch, a biologist at SCBI who works with the kingfishers. "Every step along the way—diet, habitat, breeding—there were issues."

Today—as a result of all that hard work—the world's population of Micronesian kingfishers has grown to 159 individuals. And biologists know exactly what the colorful birds most like to eat—lizards.

STEP 3: Keep a Clean Workspace

Above and beyond keeping animals alive, biologists focus on keeping them healthy.

Animals brought in from the wild need to be examined and treated for diseases and parasites. In any zoo or breeding center, this involves keeping an animal in a "quarantine" state until scientists are confident in its good health.

The stakes are higher with animals already threatened by disease. The chytrid fungus that is sweeping through the world's amphibians, for example, is particularly virulent and toxic to harlequin toads. Many individuals are already carrying this potential killer when scientists collect them from the wild. The infected toads must be treated with a medicinal bath before they can be allowed to interact with other harlequin toads in human care. The biologists can also spread the fungus, and must take extraordinary care, wearing surgical protective gear when working with the toads, and being careful to avoid contamination from

quarantine populations to the already-quarantined and healthy insurance populations.

The same is true of black-footed ferrets, which are highly susceptible to canine distemper and sylvatic plague—called bubonic plague in humans. Scientists have developed safe, effective vaccines that protect ferrets against both diseases. All captive ferrets are now vaccinated against canine distemper and rabies, while ferrets selected for reintroduction into the wild are also vaccinated for plague. But ferrets are also extremely susceptible to other diseases, such as influenza, and humans taking care of them often don protective gear.

Ferrets' susceptibility to disease is possibly due to something scientists call a "founder effect." Since they are descended from so few "founding" animals, their genetic diversity is often very low. A healthy population, with healthy levels of genetic diversity, is often more resistant to diseases.

ERIC LONG

JIM JENKINS/FONZ PHOTO CLUB

JESSIE COHEN/NZP

CLOCKWISE FROM TOP LEFT: **Guam rails were hunted off their native island of Guam by introduced brown tree snakes. Now, 10 of these birds live and breed at the Smithsonian Conservation Biology Institute; this Guam rail chick, hatched at the Zoo's Bird House, may eventually be released into the wild; Guam rails are flightless birds and live their lives on the ground; the Zoo is home to three Micronesian kingfishers, another species once native to Guam before the arrival of the brown tree snake. An additional seven Micronesian kingfishers live at SCBI.**

STEP 4: Insert Tab A into Slot B

Once you're able to take care of an animal, your next priority is to make more of it. In the beginning this is a matter of urgency, and quantity is often most important.

"The priority with a really small population is to get their numbers up as soon as possible," says Ballou. "Breed anyone you can with everyone you can. If you don't breed each animal, you've wasted that opportunity, you've lost those genes forever."

In a perfect world, scientists would proceed strategically, using breeding programs designed by Ballou and employed successfully with countless species. However, when time is of the essence, as Paul Marinari senior curator of animal operations at SCBI says, "sometimes genetics goes out the window. You have to make some assumptions about these animals—who was related to whom in the wild—and make your recommendations based on that."

As time and technology proceed, however, genetics testing is growing faster and more reliable than before. Rob Fleischer, head of SCBI's Center for Conservation and Evolutionary Genetics, has assessed the genetics and pedigrees of myriad imperiled species, including the Hawaiian crow—also known as the alala—the

PAM JENKINS/FONZ PHOTO CLUB

scimitar-horned oryx, harlequin toads, and myriad other species.

The better scientists understand the genetics of a species and its remaining individuals, the better they can design breeding programs to keep the population healthy over the long term. Once scientists have determined the ideal breeding scheme for maximum genetic diversity, the trick is often getting the animals to actually go along with it and create viable offspring. This is rarely as easy as it seems like it should be.

Sometimes breeding takes place, but babies are not produced. In whooping cranes, for example, up to 55 percent of all eggs are infertile. Scientists don't yet know why. SCBI reproductive physiologist Nucharin Songsasen is studying fecal hormone levels to pinpoint possible issues and increase the number of whooping cranes.

Sometimes, animals that are genetically compatible are socially or physically incompatible. In such cases, scientists step in with assisted reproductive technology.

In some cases, the trouble is simply a matter of timing—perhaps one or both individuals are just not ready to breed. To make this determination, scientists assess the animal's reproductive state. This can be a challenge, especially with larger animals like Przewalski's horses or scimitar-horned oryx. To help, scientists often train animals to walk or stand in chute systems so they can safely sample the animal's hormone levels, collect semen, or test a female for fertility or pregnancy.

Other individuals require more intensive interventions, such as artificial insemination. This allows scientists to breed two individuals that might be a good genetic match, but are located far apart or simply do not get along. The goal is to ensure that genes get passed from one generation to the next, and that valuable genes and genetic diversity are not lost.

This genetic intervention applies to the future as well. Scientists collect, freeze, and store biomaterials—including eggs, ovaries, sperm, testes, and even embryos—as a supplemental insurance policy against future extinction risks.

Already, scientists have been able to use frozen sperm to create viable pregnancies and offspring through artificial insemination in giant pandas, black-footed ferrets, and several other species. They're working on developing and perfecting similar technology for use in other species, such as Przewalski's horses and oryx.

"It's extremely important now to store and keep these biomaterials for the future, because at some point we will have the technology to use them," says SCBI research veterinarian Pierre Comizzoli. "We want to be sure we preserve the genetics of the species for the long-term."

STEP 5: Just Add Water (and Habitat)

Once biologists have a sufficiently stable captive population with relatively reliable reproduction, they start thinking about getting animals back into the wild.

First, though, they must ensure there's enough wild for the species to return to.

"Anytime you're talking about returning a species to the wild, particularly if it's gone extinct or been extirpated, there are reasons why that species is gone," says Melissa Songer, a conservation biologist at SCBI. "The challenge is finding a place where those threats have either been mitigated or the situation is not so serious."

Songer works with two endangered species: Przewalski's horses, which were once extinct in the wild and have now been reintroduced to Mongolia and China, and scimitar-horned oryx, which will soon be reintroduced to Chad. In China and Mongolia, Songer and her team worked with local people to educate them about sharing land with Przewalski's horses and preventing the wild horses from interbreeding with domestic horses. In Chad—where oryx went extinct—the civil war that contributed to their decline is over, and they're being reintroduced into an area where they will be protected.

If predators drove a particular species extinct in the wild, biologists cannot just release that species back to their original habitat—the reintroduced animals would simply become very expensive snacks. On Guam, for example, introduced brown tree snakes drove both the Guam rail and the Micronesian kingfisher extinct in the wild. The snakes are still there, which means the birds cannot simply be returned to the island. Instead, the rail has been reintroduced to several large fenced-in and snake-free areas on Guam. The birds have also be released on Rota, a smaller snake-free island near Guam. Scientists hope to do the same for the Micronesian kingfisher.

Predators are not the primary concern for black-footed ferrets, but disease is. To prevent widespread infection, scientists vaccinate ferrets against both distemper and plague before releasing them into the wild. But it is not enough to protect the ferrets. Biologists must also protect prairie dogs—upon which ferrets depend for food and shelter. To do so, wildlife biologists

Przewalski's horses dropped to a global population of approximately 50 animals.

JESSIE COHEN/NZP

treat prairie dog burrows for fleas and are testing large vaccination programs in wild prairie dog towns, inoculating the animals against both canine distemper and plague. As a result of these programs and careful reintroduction efforts, 300-500 black-footed ferrets live in the wild today. Every year the Zoo sends 25 to 40 additional animals to be released into the wild.

STEP 6: Repeat as Needed

Even once the land is ready for them, releasing an animal into the wild is rarely as simple as opening a crate and letting the animal run free. Oftentimes, biologists must first acclimate the animals to their native habitat.

Black-footed ferrets go through a "boot camp" that trains them in how to use prairie dog tunnels as homes—which they do naturally—and how to hunt and kill live prey.

Przewalski's horses went through what Songer calls a "soft" release. They were introduced into wild areas, but were protected or fed during the brutal winter months. Over time, these populations have become truly wild and self-sustaining.

"When you're reintroducing captive-born animals, you're going to have a lot more challenges than you're going to have with an already wild population," Songer explains. "It's a big change for them: figuring out what to do, what to eat, how to behave."

It's much better, SCBI scientists agree, not to get to a point where reintroductions are necessary to begin with. And, if a species does appear to need help, the International Union for the Conservation of Nature now suggests establishing captive assurance populations when the wild population drops below 1,000 animals.

Dave Wildt, head of SCBI's Center for Species Survival, sums it up best: "It's not just breeding these animals in a zoo and turning them loose. It takes a huge amount of resources and a huge amount of human effort. Our position has always been that we need to start studying and protecting these animals well before they get down to the last 20 animals." SZ

BRITTANY STEFF *is an editor for the Zoo's website and a veteran* Smithsonian Zoogoer *contributor.*

MEHGAN MURPHY/NZP

The Smithsonian Conservation Biology Institute is home to a small herd of Przewalski's horses. Some of the animals born at SCBI may eventually be released into the wild to support the small and growing reintroduced population.

Building a new instrument to study Earth

GLOBAL GAME HANGER

BY LISA DUCHENE

Dried grasses, sticks, leaves, and brush snap and crunch under Jim Coloso's feet as he walks the woods at the Smithsonian Conservation Biology Institute near Front Royal, Virginia. He wears waterproof gators to protect from ticks and an orange safety vest to be easily seen.

White dogwood blossoms lace through the greening understory, birdsong flutters among the trees, and gnats swarm but don't bite in the warmth and brilliant sunshine of an early May morning.

At the first tree with a dark blue metal tag, Coloso, an ecologist, peers up through his binoculars into the canopy of a black walnut tree, counting flowers and broken—opening—buds, looking for any leaves just beginning to poke against the powder blue sky.

He estimates the fullness of the canopy and relays the numbers to Troy Spindler, a field technician—also dressed for walking off-trail—who records them on a data sheet.

One tree down. Fifty-nine to go.

They will spend their morning documenting what they see in the canopies of 60 trees, 30 each of two native species—tulip poplar and black walnut. They will also collect data on 30 invasive Japanese stiltgrass plants on their route.

Coloso did the same thing three days before and will do it again in two days—collecting this data three times a week during the spring leafout.

These routine phenology—the study of plant and animal lifecycle events—walks are just some of the boots-on-the ground data collection underway to build the National Ecological Observatory Network (NEON). When the program's 171-foot instrument tower was built in 2013, the Smithsonian Conservation Biology Institute

The NEON tower is built of metal scaffolding, measures 7 feet by 7 feet at the base, and reaches 171 feet into the air, climbing above the forest canopy.

STEVEN VOSS

The "instrument" is the network of 47 land-based sites in 20 distinct climatic ecosystem bio-regions or "domains" across the United States, including two in Alaska, one in Hawaii, and one in Puerto Rico—plus 34 aquatic sites around the country, including SCBI's Posey Creek.

Posey Creek

LISA WARE/NZP

(SCBI) became one of the first of 47 terrestial—land-based—NEON sites to be spread across the forests, grasslands, and farm fields of the United States. At each site, NEON—a non-profit funded by the National Science Foundation—is building a metal tower loaded with instruments to measure environmental conditions, plus sampling plants and animals from the forest, streams, and soil.

For the first time this past fall at SCBI, the initial set of sensors on the tower collected measurements of the sun's radiance, windspeed, precipitation and temperature.

Construction on the last site is expected to be complete by 2017. Then, in the woods of SCBI and at 46 other sites around the country, scientists and field technicians like Coloso and Spindler will gather similar data on three abundant species—in exactly the same way that Coloso and Spindler did in spring 2015. That data collection will continue for the next 30 years.

Tower by tower, data point by data point, and day by day scientists and technicians are building NEON—a vast infrastructure to collect a set of ecological data gathered in a standardized way across the continent over three decades, aiming to answer big questions about the effects of climate change, land use change, and invasive species. Tower instruments also measure suspended particulates of pollutants and will eventually have instruments that take air samples to estimate carbon dioxide and help quantify the cycling of carbon between the atmosphere and the forest.

"This is the electron smasher for ecologists," says Bill McShea, a research scientist and ecologist at SCBI.

NEON promises to give ecologists the data to "zoom out" and look at the bigger picture of environmental conditions—for example, how much carbon dioxide is in the atmosphere on any particular day—surrounding the ecosystems they study.

"We've had nothing close to that," says McShea. "NEON is the thing that's going to take our science to a scale that we haven't been at before."

An Observatory for Earth

NEON is vast in scale and scope, and will ultimately be a giant observation instrument fixed upon collecting data to explain the

LISA DUCHENE

Jim Coloso and Troy Spindler look upward to assess the state of flower bud development on tulip poplars and black walnuts.

drivers and responses of ecological change. The plan is to build an instrument as sophisticated as the Hubble Telescope—the first major optical telescope to be placed in space to observe the most distant stars and galaxies—and turn it toward Earth.

"NEON is the instrument to collect the data and those data can be used by scientists to determine what's happening," says Ty Lindberg, the NEON manager of field operations at SCBI. "We're creating a dataset that will be integral in understanding the impacts of climate change on ecosystems," says Lindberg. Scientists will be able to use it to monitor changes in precipitation and climate and plant and animal communities. "We gather the measurements to understand the signals those early buds or early robins are responding to."

The "instrument" is the network of 47 land-based sites in 20 distinct climatic ecosystem bio-regions or "domains" across the United States, including two in Alaska, one in Hawaii, and one in Puerto Rico—plus 34 aquatic sites around the country, including SCBI's Posey Creek.

The Mid-Atlantic region also includes sites at the Smithsonian's Ecological Research Center on the Chesapeake Bay in Edgewater, Maryland, and at the University of Virginia's Blandy Experimental Farm in Boyce, Virginia.

Data to Help Answer Big Questions

Bill McShea wants to know more about acorns. Along with other ecologists and forest managers, he knows acorns provide nutrients for a host of forest animals and store very well, making them a primary food in winter.

"Acorns are manna from heaven," says McShea. "Animals use them to get fat and go to sleep for the winter. Or, if you're a mouse, you can only get so fat. A fat mouse cannot outrun too many things, so a mouse stores its food outside of its body. Mice, chipmunks, squirrels, woodpeckers, turkeys—everybody is looking for acorns in the winter. When those acorns fail, everybody fails. Everybody dies over the winter."

But what drives oak trees to produce plentiful acorns one year and not the next year remains a mystery. McShea hopes that with time, study, and NEON data, ecologists will be able to learn what combination of environmental factors or events lead to abundance or shortfall in acorn production. Reaching that understanding could help managers predict when hungry bears are likely to enter neighborhoods looking for food in garbage cans, or when deer are likely to roam cornfields and roadsides.

"Those kinds of things are interesting to me because I'm interested in wildlife," says McShea. "That means I'm interested in acorns, which means I'm interested in oak trees and the physical environment around those oak trees. That's NEON. The ecosystem is everything supporting those oak trees—all the insects, all the nutrients, all the fungus life and bacteria that works together to support that oak tree or interacts with that oak tree and is the web around that oak tree, and hopefully NEON will help me understand that web."

Forests and Climate

Another critical set of questions facing ecologists and society centers on how forests and climate interact—and what role forests may play in stabilizing climate.

Overall, forests and climate interact in several important ways. Clearing, overusing, or degrading forests has contributed nearly one-third of all global carbon emissions and continues to account for approximately 8 percent of carbon emissions every year; forests can react sensitively to a changing climate; and trees may also be used as wood fuel.

There is also a tremendous amount of carbon locked within forests. Like the oceans, they are carbon sinks—ecosystems that absorb more carbon than they release. Forests have the potential to absorb and store about one-tenth of global carbon emissions projected for the first half of the century, according to FAO. Globally,

ERIC LONG/NATIONAL AIR AND SPACE MUSEUM

The Smithsonian Conservation Biology Institute makes its home on 3,200 acres of rolling fields and forest near Front Royal, Virginia.

forests already absorb approximately 30 percent of anthropogenic carbon dioxide emissions annually.

But all of those processes and dynamics are hardly well understood.

Smithsonian ecologist Kristina Anderson-Teixeira's research seeks to better understand forest-climate interactions.

Anderson-Teixeira, based at SCBI, leads the Ecosystems and Climate Research Initiative for the Center for Tropical Forest Science-Forest Global Earth Observatory (CTFS-ForestGEO), which studies how forests globally are responding to and influence climate change. CTFS-ForestGEO monitors more than 6 million trees in 62 forests and 24 countries.

"We're very concerned about how forests are going to respond to climate change and so we want to understand the basic principles of how forests are shaped by climate," explains Anderson-Teixeira. "We expect that some forests could show some quite dramatic responses to climate change that would result in feedbacks to the climate system. For instance, if a lot of trees die, carbon dioxide will be released to the atmosphere and amplify warming."

One way to study forest-climate interactions is by measuring the circumference of trees.

As trees photosynthesize sunlight and carbon dioxide into sugars to fuel growth,

NEON

The NEON tower arrived at SCBI in many pieces via flat-bed trucks. Sections of the tower were built in a staging area before being transported to the nearby construction site.

NEON

NEON

NEON

they are absorbing carbon dioxide—which eventually is returned to the atmosphere when they die.

Tree circumference grows over weeks and years as carbon is used to construct new wood. Likewise, the trunks shrink and swell over minutes and days depending on how much water they are taking up or releasing to the atmosphere.

Anderson-Teixeira and her team are using a device called a TreeHugger—which the CTFS-ForestGEO Ecosystems and Climate Research Initiative helped develop—to measure changes in the width of tree trunks. The device, a new type of automated dendrometer band, is a metal band with a spring that allows it to expand and contract with the tree's width.

The TreeHugger wraps around the tree just above breast height (1.3 meters) and runs for several months on AA batteries. As the tree's circumference changes in response to growth and rainfall, the band expands or contracts, allowing Anderson-Teixeira and her team to measure any changes. As of this summer, TreeHugger devices will be installed on about 50 trees at SCBI and on 120 trees at three other CTFS-ForestGEO sites. Each tree is also equipped with sensors to measure sap flow and study the tree's water use.

Anderson-Teixeira, her research assistant Valentine Herrmann, and their team will ultimately compare their tree circumference and sap flow data with NEON tower data on environmental conditions—including carbon dioxide levels in the atmosphere—looking for relationships and patterns among all of those measurements.

They hope to learn more about how trees interact with climate. The ultimate goal is to be able to use TreeHuggers in forests around the world to collect data about what's happening with trees and climate. Ultimately, in other words, scientists may be able to look at changes in the widths of tree trunks to better understand what is happening with the forest's carbon dioxide exchange and water uptake on any given day.

Tools for the Bigger Picture

Ecologists in the late 1990s recognized a lack of available tools and information to offer a bigger-picture view of ecological changes in space and time. Through discussions and white papers, they began to figure out what to do about that problem.

ANN BATDORF/NZP

"I'm interested in wildlife. That means I'm interestd in acorns, which means I'm interested in oak trees and the physical environment around those trees. That's NEON."

"There were starting to emerge these questions in ecology, and recognition that the way we typically do science in ecology wasn't sufficient," says Andrea Thorpe, who leads NEON's science team from its headquarters in Boulder, Colorado. "There was excellent research going on at individual sites, but it was not comparable because it was collected in different ways by different researchers. We had long-term data sets, but they were not comparable."

For example, says Thorpe, ecologists study small mammals because they have the potential to drive a lot of change in ecological communities. But there are different methods for how to safely capture the animals for data collection. The data is of greater scientific value and easier to compare if it is all collected in the same way. So part of building NEON meant deciding upon a single method to facilitate data comparison across all NEON sites.

Those early discussions among ecologists became more formal when the National Research Council (NRC) Committee on Grand Challenges in Environmental Sciences began work to identify high-priority environmental science projects. Their report, Grand Challenges in Environmental Sciences, was published in 2001 and identified the need to learn more about how changes in land use, climate, and invasive species are affecting ecosystems. The NRC report ultimately formed the scientific framework for NEON and inspired its creation. NEON was formally announced in 2001.

About a decade passed from concept to the receipt of NEON's first funding: $434 million in 2012. NSF then awarded NEON's first annual operating budget in 2014. Money for ongoing operations is expected to be awarded every three to five years.

Gathering Data

In addition to the tower, each site conducts boots-on-the ground field work to sample soil, forests, and streams. Field technicians collect data on—among other things—plant diversity and biomass by taking an annual census of every plant species in dozens of plots, and by tagging and annually measuring each woody stem in forest plots. They also use an instrument mounted to airplanes to gather data about the chemical composition of leaves throughout their study area, providing information about productivity and carbon cycling on a much larger scale and with finer resolution and accuracy than possible with on-the-ground sampling alone.

Researchers sample the abundance and diversity of birds, ground beetles, mosquitoes, and small mammals. They sample and study ticks, soil microbes, and the chemicals found in the soil. In Posey Creek at SCBI, field technicians sample stream sediment, analyze its chemistry, and conduct a census of fish abundance and diversity. They also measure the abundance

and species diversity of mayflies, stone flies, and caddis flies—all of which provide clues to the stream's health—and sample the productivity and biomass of algae and aquatic plants.

Here is how McShea describes the potential of NEON: "To me, ecologists are the doctors of the natural world. We're trying to understand how this world breathes, how the blood pumps, how this brain works. If you want your doctor to be any good, you have to be able to let that doctor work at the scale that the system works. For ecologists, it's like finally, finally we get to bring it all together and try to look at this body as a holistic thing."

This comprehensive data set will span the continent and 30 years, and be available to help ecologists answer questions they have now—or will have in the future. "There are a whole bunch of questions that we haven't even begun to think about that can potentially be answered by NEON," says Thorpe.

No shortcuts

Peering up at all those trees can give him a stiff neck, says Coloso, but it never gets tedious because he understands why it's so important to spot that first break of the buds, the value of this data collection to NEON, and the value of NEON to ecologists working to understand changes in the natural world.

There are no shortcuts—three times a week Coloso pulls on his boots to walk the forest and measure the leaf-out.

"It's pretty important in phenology to get that first pulse of green, to sense that change is happening. If you don't see those first bud-breaks you can miss a lot," says Coloso.

"It will be a long time before we see the trends from NEON because it takes years of data to draw a line through and see if there's a regression, or increasing or decreasing changes," says Coloso. "As we go on we'll see that stuff come on. That's when it will be really exciting to see the data we worked so hard on in published papers and see them and say 'Yeah, that's our data.'" SZ

—LISA DUCHENE *is an independent science writer and a frequent contributor to* Smithsonian Zoogoer.

CRISTINA SANTIESTEVAN

TreeHuggers measure changes in circumference of select trees in the SCBI forest. These metal bands are attached to a spring that allows the device to expand or contract as the tree grows.

You can't put a price on KNOWLEDGE

Except on October 3-4.
Then it is the cost of a car pass to the Autumn Conservation Festival.

This year marks the 40th anniversary of the Smithsonian Conservation Biology Institute. Join us for an unforgettable day in the foothills of the Blue Ridge Mountains. Meet scientists and animal care experts and learn about our endangered species conservation and science programs. From talks on animal care and conservation biology research to hands-on, interactive exhibits and activities showcasing our ecology programs and work to preserve habitats, come join the fun.

Car passes required for admission. One-day passes are free to FONZ SCBI Club members and FONZ members at the Patron level and above; otherwise $30 in advance, $40 at the gate. See website for bike, mid-size vehicle and tour bus rates. Maximum of six people per standard vehicle pass.

GET YOUR PASS TODAY AT FONZ.ORG/ACF.

JANICE SVEDA/FONZ PHOTO CLUB

Friends of the National Zoo

2014

ANNUAL REPORT

2014 Was Quite the Year!

We threw a big birthday party for the Zoo's littlest panda, welcomed more people than ever before to ZooLights, and saw the opening of a new exhibit for the animal that inspired the creation of the Zoo more than 125 years ago. Revisit some of our favorite dates and events with our 2014 annual report.

A Year of FONZ

Dear Friends,

It's been another memorable year for us at Friends of the National Zoo. And, as usual, so many of our proudest accomplishments were made possible through your generosity with donations, volunteer time, and more. Thank you.

Here on these pages, we've gathered together some of our favorite moments from 2014. Behind these few moments are many, many more achievements and successes, all too numerous to fit on these few pages. Our classes, camps, and other education programs, for example, reached more than 7,250 children and adults. Approximately 275,000 visitors stormed the Zoo for our popular events throughout the year. More than 1,400 volunteers donated a total of 105,435 hours of service in 2014—a value of $4 million! And an uncountable number of FONZ staff and volunteers introduced Zoo visitors to animals and science, helped parents find food and restrooms for children, answered questions about programs and schedules and public transportation, and in many other ways improved the Zoo experience for all.

These are the things that make a year—big events and small moments. And all of them are made possible and better through your support. Most importantly, your support allows us to assist the Smithsonian's National Zoo for another year of species-saving science, helping ensure the legacy of a healthy and wild planet for our children and grandchildren and beyond.

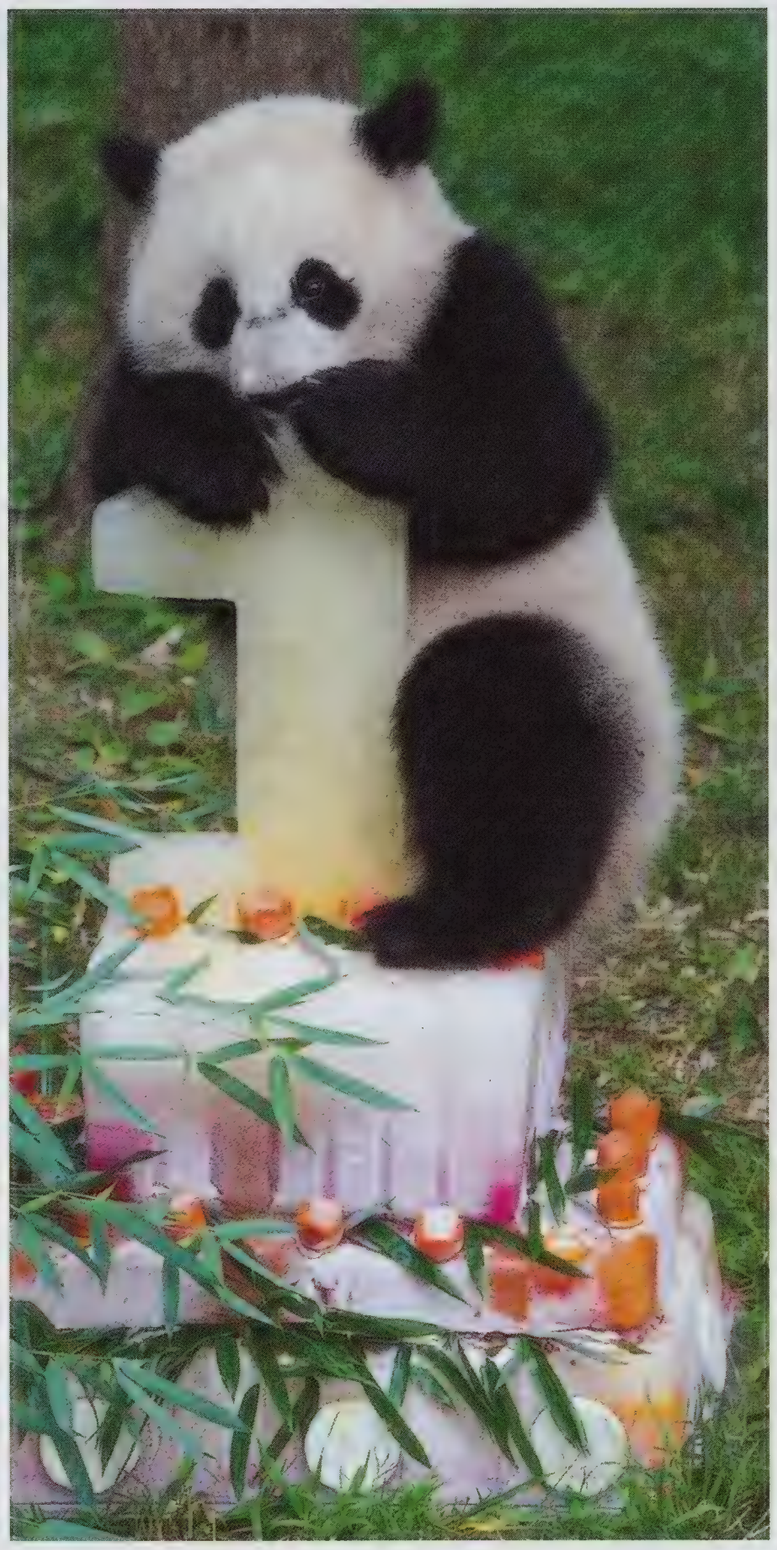
Thank you for your friendship in 2014 and in the years to come.

Sincerely,

John Ring
Chair, FONZ Board of Directors

AUGUST 23

FONZ members gathered together for a members-only pre-party for Bao Bao before joining Zoo visitors for a traditional zhuazhou ceremony to celebrate the panda's first birthday. The zhuazhou is a traditional Chinese ceremony during which symbolic objects are placed in front of a one-year-old baby. The first item the baby reaches for foretells something about its future. Of her three options, Bao Bao chose a poster of peaches, which symbolize long life.

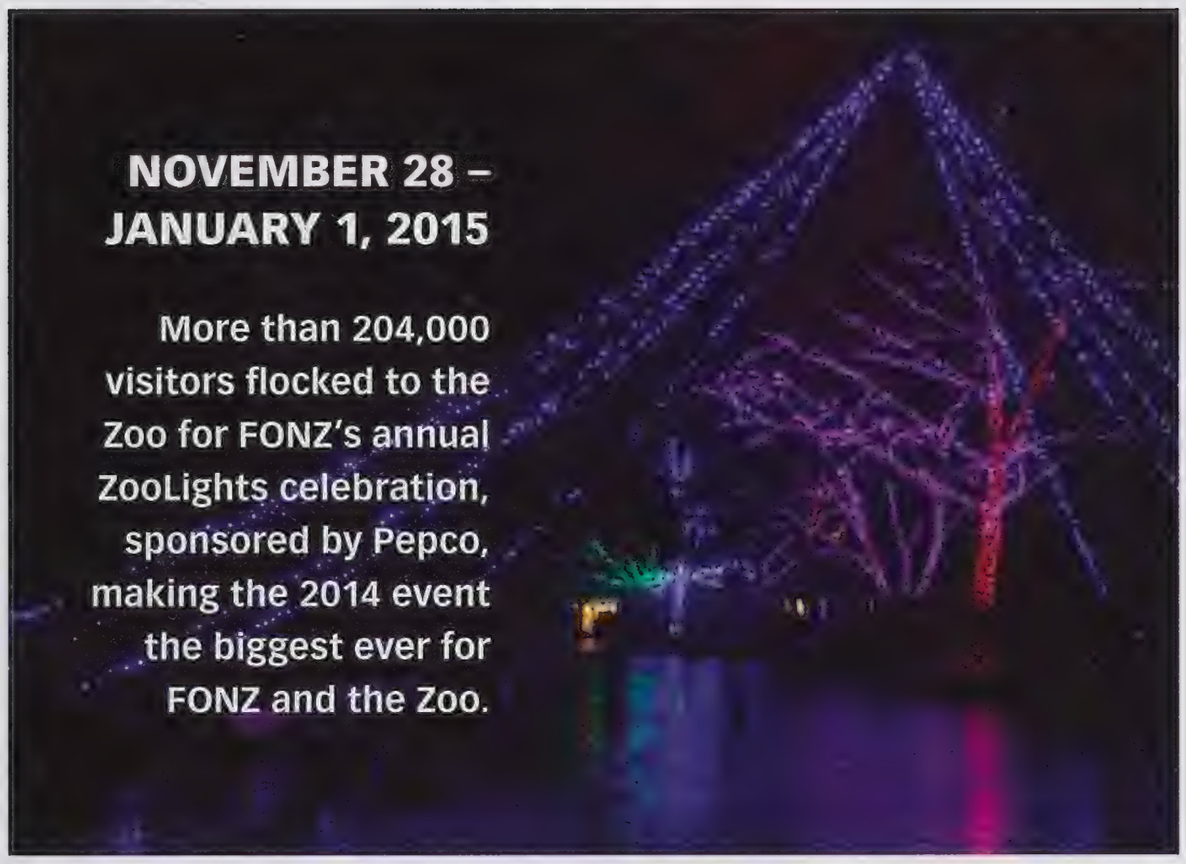


BARBARAA STATAS/FONZ PHOTO CLUB

BARBARAA STATAS/FONZ PHOTO CLUB

AUGUST 30

The largest land mammals in North America—bison—returned to the Zoo with the opening of their new exhibit along Olmsted Walk. An incredible 794 FONZ members contributed a total of $104,571 to the exhibit project. Thank you!



MARK VAN BERGH/FONZ PHOTO CLUB

NOVEMBER 28 – JANUARY 1, 2015

More than 204,000 visitors flocked to the Zoo for FONZ's annual ZooLights celebration, sponsored by Pepco, making the 2014 event the biggest ever for FONZ and the Zoo.

MARK VAN BERGH/FONZ PHOTO CLUB

OCTOBER

FONZ pledged $1 million toward the construction of a stunning new indoor-outdoor education space in the Zoo's Bird House, to be built as part of the upcoming Experience Migration exhibit.

JULIE LARSEN MAHER/WCS

FEBRUARY

Because even a single elephant death due to poaching is one too many, FONZ signed on as a supporter of the Wildlife Conservation Society's 96 Elephants Campaign, which is dedicated to improving elephant protections, strengthening ivory moratorium laws, and increasing public awareness of wildlife trafficking and elephant poaching.

MAY

FONZ members enjoyed an entire month of members-only events, activities, and more with the annual May is Members Month event.

OCTOBER

FONZ launched its newest podcast series—Other Duties as Assigned: The Secret World of Zoo Jobs—for middle school students and others curious about the many ways people work with the Zoo.

Friends of the National Zoo

2014

ANNUAL REPORT

When you support FONZ, you support the Zoo.

FONZ provided a total of **$1,720,081** to the Smithsonian's National Zoo in 2014. This support was made possible by gifts from FONZ members and donors, and helps sustain Zoo and SCBI programs, from saving species around the world to improving animal care and education in Washington, D.C., and Front Royal, Virginia.

Thank you for your support!

FINANCIAL REPORT	2014	2013
Membership	$2,665,354	$2,587,917
Contributions	$1,173,149	$107,268
Sponsorship	$813,521	$716,347
Visitor Services	$7,442,499	$10,817,780
Events	$2,214,000	$1,835,858
Education, Programs & Volunteers	$932,519	$921,518
Investments	$178,912	$239,596
Other Revenue	$1,212,079	$162,237
TOTAL SUPPORT	**$16,632,033**	**$17,388,521**
Program Expenses	$12,939,053	$12,942,254
Management and General	$532,612	$417,134
Loss on disposal of property and equipment	$4,586	$470,625
TOTAL OPERATING EXPENSES	**$13,476,251**	**13,830,013**
Additional Support to NZP and SI	$1,720,081	$3,653,238
TOTAL EXPENSES	**$15,196,332**	**$17,483,251**
CHANGE IN NET ASSETS	**$1,435,701**	**$(94,730)**

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2014
ANNUAL REPORT

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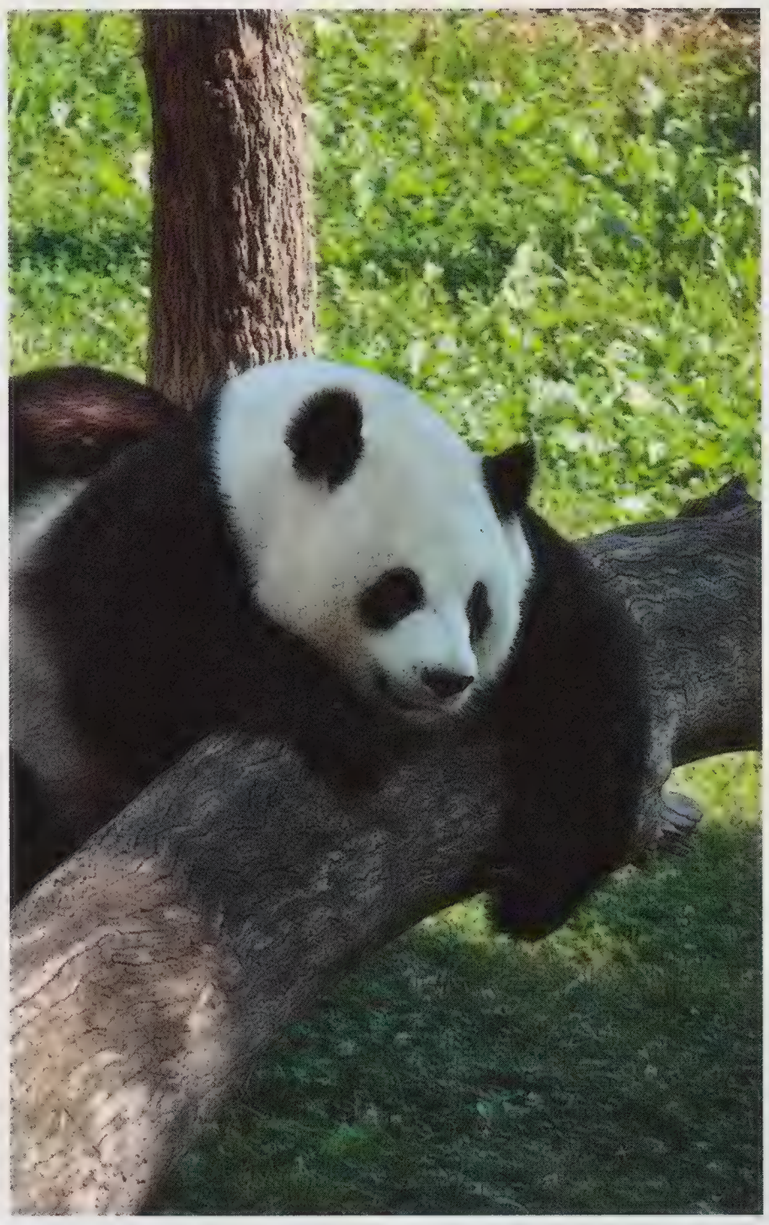

JESSIE COHEN/NZP

Friends of the National Zoo (FONZ) is the dedicated partner of the Smithsonian's National Zoo. FONZ provides exciting and enriching experiences to connect people with wildlife. Together with the Zoo, FONZ is building a society committed to restoring an endangered natural world.

Friends of the National Zoo 2014 ANNUAL REPORT

SMITHSONIAN Zoogoer kids CORNER

BEAST BITS

Many Homes

White-naped cranes live all over Asia, including Mongolia, China, and Russia. They also migrate to breeding grounds in China, Japan, and Korea. Those are a lot of places to call home! You can't see white-naped cranes at the Zoo, but you can see them at the Smithsonian Conservation Biology Institute in Front Royal, Virginia, during the Autumn Conservation Festival in October. **fonz.org/acf**

CHRIS CROWE/NZP

Fun Facts

Red pandas have vivid red fur. When it gets colder in the winter, their fur gets thicker and even brighter. This means red pandas are easier to spot when it's cold out!

BARBARA STATAS/FONZ PHOTO CLUB

Playing in the Dirt

Dogs aren't the only animals that like to roll around in the dirt. Bison also enjoy a 'wallow' in dust and mud to keep cool and soothe insect bites. The bison at the Zoo create their own special spots so they can wallow whenever they want! You can see bison at the Zoo and also at the Autumn Conservation Festival this October in Front Royal, Virginia. **fonz.org/acf**

CREATURE FEATURE

Maned wolves are odd looking animals, with long legs and big ears. Let's find out what's fun about them.

Strange WOLVES

DEVIN MILLER

SMITHSONIAN zoogoer kids CORNER

Southern WOLF

Maned wolves live in Argentina, Brazil, Paraguay, Bolivia, and Peru. And they're not picky about the neighborhood either. They'll live in forests, open plains, and even marshland.

FUNNY Looking

With their long legs and fox-like faces, maned wolves don't really look much like wolves. Their big ears and the mane along their neck and back add to their interesting appearance.

Twitchy EARS

Can you wriggle your ears? Maned wolves can! They can rotate their large ears, which would definitely impress the other kids at school. But they don't do it to show off to their friends. The wolves move their ears to listen for prey in the grass.

TAP Dancing

Rotating ears aren't the only thing maned wolves use to help catch their prey. They also tap their front paw against the ground to try and flush out their prey. If this tapping works, the wolf pounces on their prey when it comes out. And then it's dinner time!

Food TIME

Maned wolves aren't picky eaters at the dinner table. They're omnivorous, which means they'll eat just about anything, both plants and animals. A maned wolf meal could include small mammals, reptiles, birds, bird eggs, insects, fruits, or plants.

RHONDA GREGORIO/NZP

PROTECTING Wolves

Maned wolves are threatened by habitat destruction and hunting. The Zoo has been working to protect maned wolves for nearly 30 years, developing breeding programs for wolves in zoos and working to save them in the wild.

Double TROUBLE

You can see maned wolves at the Zoo's Cheetah Conservation Station and also at the Smithsonian Conservation Biology Institute in Front Royal, Virginia, during the Autumn Conservation Festival this October. **fonz.org/acf**

YOUR TURN

What would it be like to live as an animal at the Zoo? How would you like your exhibit, the food, or the visitors? Imagine what life would be like as a Zoo animal. Then let us know at **zoogoer@si.edu**.

FONZ RESOURCES

fonz.org

Member/Donor Information
202.633.2922

Special Events
202.633.4470

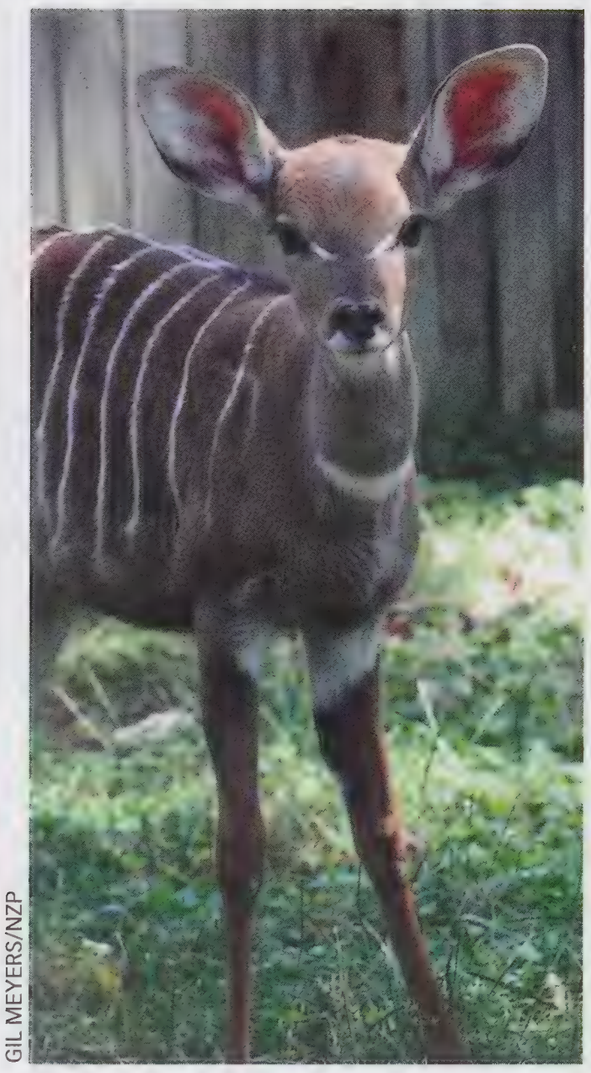
Corporate Events
202.633.3045

Camps and Classes
202.633.3024

Volunteer Services
202.633.3025

Comments? Questions?
Please email us at
fonzmember@si.edu

Not a FONZ member yet?
Call 202.633.2922
or go to
fonz.org/join



GIL MEYERS/NZP

FONZ Children's Classes

Learning is wild at the National Zoo!

FONZ classes use hands-on activities, crafts, and the Zoo's animal collection to help your child learn about environmental conservation and life science while strengthening important developmental and social skills. Whether you prefer a regular weekly experience with your child or a one-time event for the family, you are sure to find a class to suit the needs of your young animal lover.

All 2015-2016 class series are now open for registration!

Classes do not include behind-the-scenes visits or direct contact with the animals, but do use pelts, bones, feathers, and other touchable artifacts. For everyone's safety and enjoyment, unregistered children may not attend, with the exception of non-crawling infants.

CLASS SERIES
FONZ Member: **$150**
Non-member: **$187.50**

WEEKEND CLASSES
FONZ Member: **$28 per child**
Non-member: **$35 per child**

Use code BISON2015 to claim your member rate: fonz.org/classes

CLASS SERIES (AGES 2–5, varies by class)

Class series meet once a week for five weeks. Children build their knowledge of animals and the natural world while strengthening important academic, developmental, and social skills. Details and full class list online: fonz.org/classes

>> TADPOLES (AGES 2–3)

FONZ Tadpole classes are perfect for children preparing for preschool. We'll discover a new animal each week and will practice important developmental skills. Classes meet one morning per week: M-F at 10-11:30 a.m., and Saturday at 9-10:30 a.m.; no class the week of Thanksgiving.

Who's New at the National Zoo

September 14–October 17

Who's New at the National Zoo? Lots of animal friends, waiting for you! Learn about some of the Zoo's newest arrivals, including the Andean bear cubs. Children will make a "Who Am I" book to take home. (Note: this class does not repeat content from the 2014 "Who's New" class.)

Animals Around the World

November 2–December 12

Pack your bags and join our animal ambassadors as we travel the world learning about our animal friends. From the meerkats of Africa to the Amazonian arapaima, there is so much to see. No passports necessary!

>> FROGS (AGES 3–5)

FONZ Frog classes are just right for those 3-5 year olds ready to leap into new challenges. We'll explore a different animal each week with themes that stretch both our brains and our imaginations!
Classes meet one afternoon per week: Tuesday or Wednesday at 1–2:30 p.m.; no class the week of Thanksgiving.

I Want to Be a Zoo Keeper

September 15–October 14

Do you have what it takes to be a zoo keeper, vet, or nutritionist? Learn the ropes and practice your skills in How Do You Zoo, our one-of-a-kind interactive play space. Each week we will focus on a different Zoo career and animal.

Animals Around the World

November 3–December 9

Pack your bags and join our animal ambassadors as we travel the world learning about our animal friends. From the meerkats of Africa to the Amazonian arapaima, there is so much to see! (Classes are more advanced versions of the Tadpole series.)

ABBY WOOD/NZP

FONZ MEMBERS SAVE!
Use code **BISON2015** to claim your FONZ member discount!

HOMESCHOOL CLASSES (AGES 5–12)

Homeschool Classes at the National Zoo investigate a new theme each academic year. Each 5-week class explores the theme from a new angle, discovering new connections between the animals and the ideas we study. Hands-on science experiments, inquiry-based learning, and Zoo walks led by our expert teachers bring these concepts to life.

Classes meet Mondays from 10:30 a.m. to 12:45 p.m. or Thursdays at 10-noon; no class the week of Thanksgiving.

Marvelous Migrations

September 14–October 15

We'll take to the skies, oceans, and plains as we explore the mysteries of migration and learn why migration's not just for the birds; it's also for the turtles, whales, butterflies, and bison.

Winter Wild

November 2–December 10

It takes skills, smarts, and strength to be a cool creature in a wintery world. We'll discover how some animals survive the cold, from diapause to disguise and more.

BIG SAVINGS FOR BIG LEARNERS!
Register your child for all five 2015–2016 Class Series or Homeschool Classes, and **save an additional 10 percent.** That's a savings of $75 for FONZ members!
Offer available for Class Series and Homeschool Classes only.

WEEKEND FAMILY PROGRAMS

(AGES 2–5, varies by program)

These one-time classes are designed for children and their parents to enjoy together! Interactive stations introduce participants to animals and concepts before a hands-on discussion gets children ready to visit the animals of the day! Details online: fonz.org/classes

Weekend Family Programs meet Saturdays or Sundays; see class listings for specific dates and times.

Breakfast with the Bears (ages 2–3)

October 4 at 9–10:30 a.m.

Bring your favorite snack and join us for a real teddy bear picnic! We'll learn about the Zoo's three kinds of bears and their favorite foods, then we'll join them outside for a picnic snack.

Utterly, Otter-ly Awesome (ages 3–5)

October 18 at 9–10:30 a.m.

What's better than a family of otters? Nothing we can imagine! Dive into the watery world of these social swimmers and join the fun.

Curious George Goes Ape (ages 3–5)

October 11 or November 1 at 9–10:30 a.m.

Curious George introduces us to the great apes! We'll take a peek at George's family album, learn about orangutans and gorillas, and swing on down to the Great Ape House together!

Curious George Goes to the Zoo (ages 2–3)

November 7 or 8 at 9–10:30 a.m.

Curious George loves to explore, just like the monkeys in the Small Mammal House. We'll put on our yellow hats and pay a visit to some of our favorite pint-sized primates!

Spots and Stripes (ages 2–3)

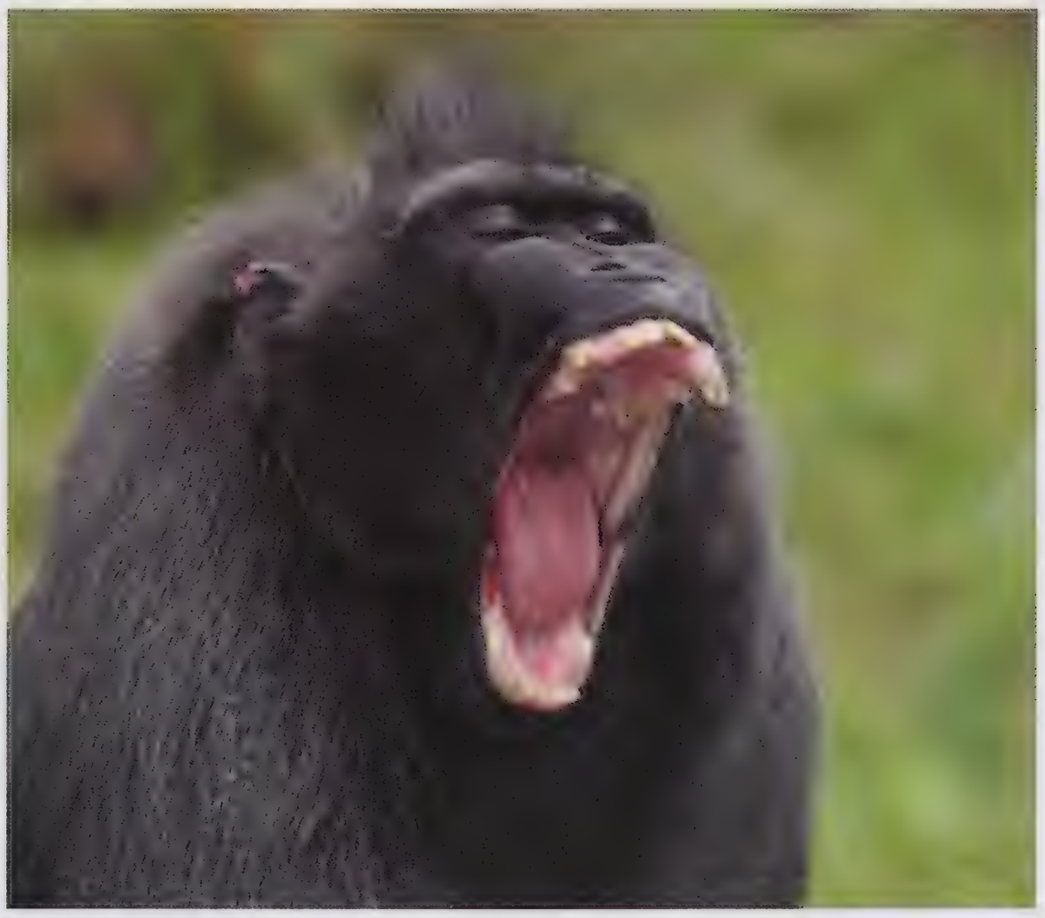
November 15 at 9–10:30 a.m.

In the animal world, patterns aren't just pretty, they are pretty important! Join us for some pattern play and learn how spots and stripes help animals survive.

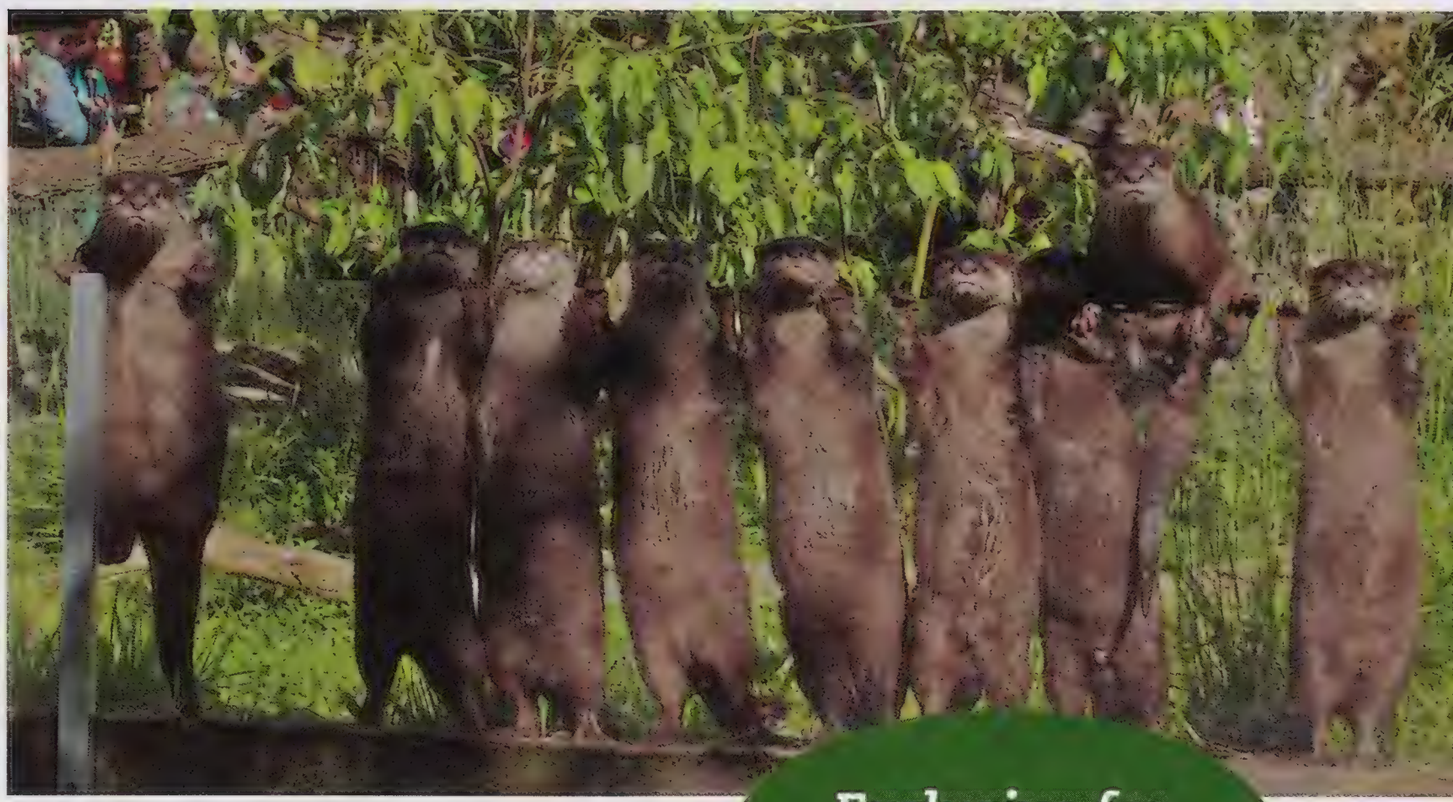
REGISTER TODAY!

See detailed descriptions and register online: **fonz.org/classes**

ANN BATDORF/NZP



MEGAN MURPHY/NZP



CLYDE NISHIMURA/FONZ PHOTO CLUB

Exclusive for FONZ members!

Party with the Animals!

Give your child a birthday party worth roaring about with a celebration at the Zoo. Your child and guests will don safari hats and explore the Zoo with a private tour guide. Parties are for children ages 4–8.

Registration for 2016 birthday parties begins soon!
FONZ Premier+ members: Registration begins October 27
All other FONZ members: Registration begins November 3
Learn more and register online: **fonz.org/birthday**

FONZ Annual Meeting

Meet FONZ's new executive director and your Board of Directors, and mingle with your fellow Friends of the National Zoo members at the 57th Annual Meeting in the Zoo's Visitor Center auditorium. Events will kick off with light refreshments, followed by updates on FONZ and Zoo accomplishments and plans, as well as the introduction of newly-elected officers and members of the FONZ Board of Directors.

Date and time to be determined.

Learn more and RSVP online: **fonz.org/annualmeeting**

PLEASE VOTE: FONZ Board Election.

Voting begins early October at fonz.org/ballot2015

Soon, voting will begin for filling several positions on the Friends of the National Zoo Board of Directors. In accordance with the FONZ bylaws, each nominee is a FONZ member, was nominated by a dues-paying FONZ member, and has been carefully reviewed by the Board's Nominating Committee.

Ballots and information about the candidates will be available online at **fonz.org/ballot2015**

We also want to thank our outgoing Board members for their service. We are grateful for the time and effort they have devoted toward advancing the missions of FONZ and the Smithsonian's National Zoo.

You BREW Us Away with Your Support!

Thank you for joining us for our 2015 Brew at the Zoo. We had fun. We played games. We sampled beer and delicious food. And, best of all, we joined together to help raise essential funds that will support the Zoo through 2015 and beyond!

MARK VAN BERGH/FONZ PHOTO CLUB

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FOOD

Blackfinn Ameripub
Brookland Pint
Cabot Creamery
Cashion's Eat Place
Compass Rose
Galley
Jack Rose Dining Saloon
Matchbox
Meridian Pint
Pinstripes
Plan B Burger Bar
Provision No. 14
Roofers Union
Rural Society
Silo Restaurant
Smoke & Barrel
Tonic at Quigley's

DRINK

3 Stars Brewing Company
Adroit Theory Brewing
Allagash Brewing Company
Alltech Lexington Brewing Co.
Anchor Brewing Company
Atlas Brew Works
BadWolf Brewing Company
Blue Jacket
Blue Mountain Brewery
Blue Point Brewing Company
Bold Rock Hard Cider
Boston Beer Company
Boulevard Brewing Company
Breckenridge Brewery
Brewery Ommegang
Brooklyn Brewery
Brothers Craft Brewing
Caboose Brewing Co.
Capitol City Brewing Company
Chesapeake Brewing Company
Constellation Brands Beer Division
Crooked Run Brewing
DC Brau Brewing Company
Denizens Brewing Co.
Deschutes Brewery
Devils Backbone
Duck Rabbit
Elysian Brewing Company
Evolution Craft Brewing Company
Firestone Walker Brewing Company
Flying Dog Brewery
Flying Fish Brewing Company
Foothills Brewing
Fordham & Dominion Brewing Co.
Founders Brewing Co.
Full Tilt Brewing
Goose Island
Great American Restaurants
Great Lakes Brewing Company
Hardywood Park Craft Brewery
Harpoon Brewery
Heavy Seas
Hellbender Brewing Company
Heritage Brewing Co.
Hoegaarden
Lagunitas Brewing Co.
Left Hand Brewing Company
Lost Rhino Brewing Company
Mad Fox Brewing Company
Narragansett Brewing Co.
Natty Greene's Brewing Co.
Ocelot Brewing Co.
Old Bust Head Brewing Co.
Old Ox Brewery
Oliver Brewing Company
Original Sin Hard Cider
Oskar Blues Brewery
Palm Breweries
Peak Organic Brewing Co.
Port City Brewing Company
Roy-Pitz Brewing Co.
RAR Brewing
Right Proper Brewing Company
Schlafly
Schlossbrauerei "Fatti" Stelzer
Schofferhofer Brewing
Shiner Beers
Shipyard Brewing Co.
Sierra Nevada Brewing Company
Sixpoint Brewery
Sly Fox
Stella Artois
SweetWater Brewery
The Brewer's Art
The Matt Brewing Company
Three Notch'd Brewing Company
Troegs Brewery
Union Craft Brewing
Victory Brewing Company
Weyerbaucher
Wild Wolf Brewing Company

A PARTY TO DIE FOR

Night of the Living Zoo. A Halloween party for adults. With live music, craft beer, and a wicked costume contest, it's a great way to support animal conservation at the Smithsonian's National Zoo and around the world. Tickets are available to members first September 18. Missing the fun would be a grave mistake. SPONSORED BY LIVINGSOCIAL & WRQX – DC'S 107.3

OCTOBER 30, 2015 | TICKETS SELL FAST, ORDER SOON! | **FONZ.ORG/NOLZ**

JON MCRAY/FONZ PHOTO CLUB

High-Climbing Orangutans

"The National Zoo's O-Line is one of the coolest things at the Zoo," says FONZ Photo Club member Jon McRay. "Seeing the orangutans travel from one building to another—high above the visitors and without a net—is amazing. And it is exactly what orangutans might do in the wild, it is natural to them, easy, and without risk."

McRay took this playful image on a bright October day. "I backed up in the picnic area and shot at a wide angle to capture both orangutans crossing. I especially liked the fall colors, clear blue sky, and unbalanced composition."

Technical Notes —

CAMERA: NIKON D4 ; **LENS:** 28-300MM AT 48MM
ISO: 280; **EXPOSURE:** 1/1250 SEC AT F6.3

Submit Your Photos!

Smithsonian Zoogoer welcomes FONZ members' submissions of photos taken at the Zoo. Please send photos to Zoogoer@si.edu. We will contact you if we are able to use your picture for the Zoo View page.

Join the Club!

Membership in the FONZ Photo Club is open to photographers of all skill levels. The group meets monthly to hear guest speakers and to share and discuss members' work. Learn more at **fonz.org/photoclub**.

BOO AT THE ZOO

$20 FONZ MEMBERS; $30 NONMEMBERS

JOIN US OCTOBER 23, 24, & 25 for Washington DC's favorite not-so-spooky Halloween haunt, Boo at the Zoo. With more than 40 treat stations, animal demonstrations, jugglers, musicians, and a hay maze, this frightfully fun evening is a treat for the whole family. Proceeds benefit animal care, education, and conservation programs at the Zoo. **Tickets are available to members first on September 1. FONZ.ORG/BOO.**

Sponsored by: BIG 100.3, Big Bus Tours, The Coca-Cola Company, Comcast, FedEx and Safe Kids Worldwide, GEICO, Hair Cuttery, HOT 99.5, HBP Printing, Mars, Incorporated, 97.1 WASH-FM, Washington Parent, The Washington Post, Whole Foods Market®, and 98.7 WMZQ.

FONZ
Friends of the National Zoo

Friends of the National Zoo, PO Box 37012, MRC 5516, NW, Washington, DC 20013-7012, **www.fonz.org**

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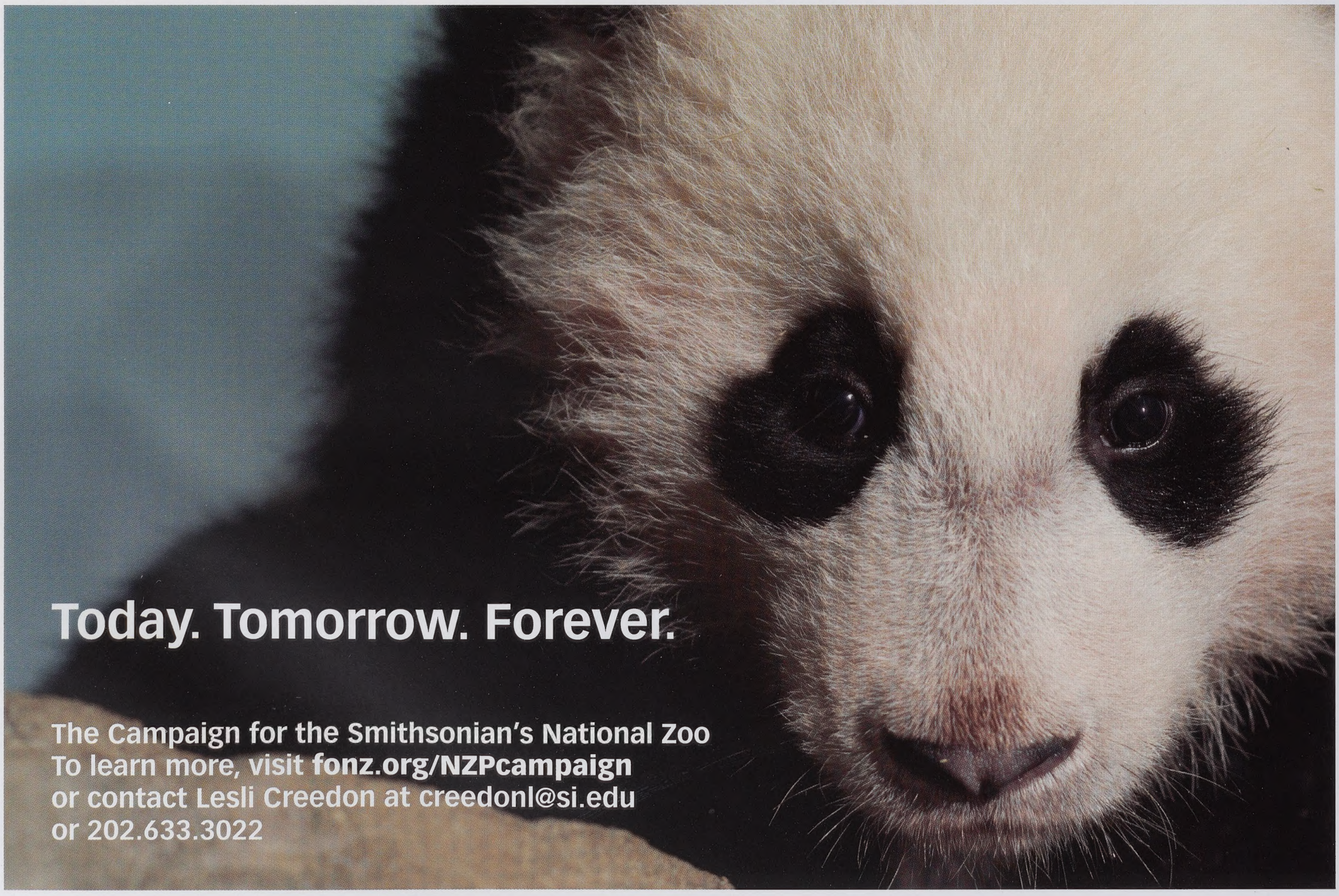
Thank you for being a FONZ member.
Your membership supports animal care, science, conservation, and more.